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ABSTRACT

This activity involved on-line tutoring by preservice teachers for high-risk students. It was part of a Technology Literacy Challenge Fund grant from the Michigan Department of Education. The project provided iMac computers and other technology resources in 20 classrooms within four Detroit public schools. Each computer was connected to the school district server for Internet access. The project provided additional technology resources for each school's computer lab or media center. In these schools, the majority of students were eligible for free or reduced lunches, and their academic achievement was substantially below state averages. Regular instruction for teachers helped them explore ways in which they and their students could use some of the educational applications available through the Internet. Teachers selected five students who could improve their academic achievement through this additional support. Preservice teachers were trained in how to plan and proceed with tutoring in how to use the software. Students and preservice teachers used a telephone connection during tutoring sessions for verbal exchanges, while the Internet connection was for displaying games, Web sites, and text. Written transcripts of the online tutoring sessions provide feedback on the program. Data are examined using Vygotsky's Zone of Proximal Development. (Contains 18 references.) (SM)

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ON-LINE TUTORING BY PRESERVICE TEACHERS

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Background Information: This on-line activity was part of a Technology Literacy Challenge Fund grant from the Michigan Department of Education. The project provided one iMac computer and other technology resources in 20 classrooms of 4 Detroit Public Schools. It also provided additional technology resources for each school's computer lab or media center. In these schools more than 75% of the students were eligible for free and reduced lunches and their academic achievement was substantially below the State averages. Each computer in the classroom was connected to the District server for access to the internet.

Regular inservice instruction for teachers helped them to explore ways in which they and their students could use some of the educational applications available through the internet. Quarterly progress reports and a final report may be found on the project's home page at:

<http://www.coe.wayne.edu/~gsmith/TLCF1>

As reported by Gordon, tutoring has been actively practiced by the ancient cultures extending into the Middle Ages, the Renaissance and currently by artificial intelligence researchers developing various forms of intelligent computer assisted instruction(Gordon, 1990). Articles in educational literature abound with reports of peer tutoring and cross-age tutoring, with subjective, anecdotal reports of their successes(Johns, 1995; Miller, 1993; Smith, 1993). Jacksonville State University in Alabama has a program in which preservice teachers are expected to engage in face-to-

face tutoring of students as part of their field experiences(Zemanko, 1996). [3] The Russian psychologist, Lev Vygotsky, contended that successful one-to-one tutoring has been underway from the earliest times as parents trained their children so that they could function effectively within the family (Vygotsky, 1987).

The main conclusion to derived from these remarks is that one-to-one tutoring is an effective method of teaching. Bloom reported a study of average students who were tutored and compared them with their classmates who participated only in the conventional classroom instruction (Bloom, 1984). Based upon his evaluations, Bloom concluded that the mean scores of the students tutored in one-to-one sessions were two standard deviations greater than the mean scores of the students who participated in the conventional classroom with 30 students per teacher.

Procedure: Teachers selected five students whom they believed were able to improve their achievement through this additional attention and support. As part of the project, the teachers had identified those content standards of the Michigan Curriculum Framework which they would be studying for the semester (Michigan, 1998). They also provided samples of the types of exercises which the tutees were having difficulty completing successfully. These documents provided the basis for the conversations which the preservice teachers would plan and carry out with the tutees.

We considered CU-SeeMe, NetMeeting, and Netscape Communicator Conference as alternatives to use in the on-line tutoring. We selected Netscape Conference software as the browser to be used to connect preservice teachers and students. It had the capability of providing a whiteboard with graphic tools to create shapes or display images as well as

chat capability for primarily text conversations. At that time, CU-SeeMe had revised their program and did not include a whiteboard in the revised version.

The Netscape Conference program also has the capability for collaborative browsing between the two workstations so that the preservice teacher could take the student to one or another Web site and they could explore various parts of that home site together. NetMeeting did not have this capability.

After teachers had identified five students in each school to participate in on-line tutoring, it was necessary to establish a schedule which students and preservice teachers could attend. Initially, a preservice teacher was employed to meet the tutoring schedule, but then tutoring was accomplished with students who were enrolled in an introductory computer applications class in the College of Education. The preservice teachers were given written instructions as to how to plan and proceed with the tutoring process, followed by a brief practical training exercise using the software.

To initiate on-line tutoring in the participating schools, it was important to establish an iMac with access to a telephone line and located in the school's media center or computer lab. The student used the iMac, modem, telephone line and Netscape browser to establish an internet connection. In the College of Education at Wayne State University, the preservice teacher used a computer with Netscape to contact the student and carry out the on-line tutoring process.

During each of the on-line tutoring sessions, Prof. Smith was in the room with the preservice teacher to cope with any unforeseen difficulties, e.g., student stepping on the phone line which broke the internet

connection. The student and preservice teachers used a telephone connection for their verbal exchanges and the internet connection was used to display graphics, web sites, and text. Preservice teachers could display geometric figures, poems, factor trees as well as maps on the whiteboard. Both the preservice teacher and student could view or modify the graphics or text on their computer screen. A tape recording of the telephone conversation was made of each tutoring session. At the beginning of each session, the preservice teacher stated, "This conversation is being recorded, and you may stop at any time."

Problems Encountered: It was initially intended to use the District server to exchange conversations between the students and the preservice teachers. However, the District server had a firewall which prevented this exchange and we were never able to persuade the District Data Processing Division to permit this exchange. Therefore, we used the telephone line at the school to connect to the Wayne State University computer and established internet access in this way.

We used the internal 56Kb modem in the iMac with the school telephone line to access the Wayne State computer. This permitted the preservice teacher and the student to exchange graphics, text and verbal communication. Exchange of data over the telephone lines was never 56Kb, but about one-half that rate which degraded the voice communication. Therefore, a second line was used to permit fluent exchange of remarks by the preservice teacher and the student.

Analysis of Data: The information in this report is preliminary, because we are continuing to look at the data from various perspectives. One approach was to review the written transcripts of the conversations between preservice teacher and student in terms of the types of questions

asked by the preservice teacher. We used the Gallagher/Bloom model to identify questions asked by the preservice teachers (Wilen,1991). Questions were classified as low convergent, high convergent, low divergent, or high divergent. The following four items indicate within parentheses the corresponding ratings on the Bloom Taxonomy of Educational Objectives. The question categories were: 1) low convergent (memory, recall), 2) high convergent (translation, interpretation, application), 3) low divergent (analysis), and 4)high divergent (synthesis, evaluation). The low convergent questions asked the student to reply with an answer which was explicit or factual level on Bloom's Taxonomy scale. While the divergent questions asked the student to analyze a situation and offer an opinion with supporting facts in relation to values or standards.

Figure 1 in the Appendix shows examples of the frequencies of curriculum questions which were asked by a preservice teacher, and classified as convergent or divergent as indicated by a close review of the written transcript of each conversation. As shown in Figure 1, the large majority of questions asked by this preservice teacher were low convergent, emphasizing memory and recall of specific facts or ideas. Other figures show that there were several high convergent questions asked by the preservice teachers, and a small number of low divergent or high divergent questions were posed. As one might expect, there were variations in the types of questions asked by different preservice teachers and variations in types of questions asked in relation to the curriculum content being discussed. It will require further analyses of existing data and collection of more samples in order to estimate whether these variations are dependent upon the curriculum content, the characteristics of the preservice teacher asking the questions, or some other variable.

Another approach to examining the data is based upon the concept of the Zone of Proximal Development(ZPD) which the late Lev Vygotsky proffered(Vygotsky, 1978). To paraphrase his observations, Vygotsky said that there is an area of the one-to-one conversation in which the student operates with complete understanding during the exchange of ideas with the other person, and there is a second area in the conversation in which the student cannot participate with understanding without the assistance of the other person who may be an adult or knowledgeable peer. It is this second area which is the Zone of Proximal Development(ZPD).

In our analysis of the conversation between preservice teacher and student, we drew upon Vygotsky's concept of the ZPD. In the graph in Figure 5 please consider the zero base line to be the border of the Zone of Proximal Development. Each remark made by the adult preservice teacher was considered in relation to the reply by the student as being understood, not understood, or not clearly received by the student.

The vertical bars below the zero line indicate the sequence of verbal exchanges which were made in which the student completely understood what was said in the conversation, as indicated by a review of the written transcript. The vertical bars above the zero line indicated the number of exchanges between tutor and tutee when the student's reply indicated that the student did not understand what they were talking about.

If a vertical bar reached 2 or 3 magnitudes above the zero base line, this indicated that the tutor had allowed the student to remain without an understanding of what they were talking about for 2 or 3 conversational exchanges. The sequence of vertical bars below the zero line indicated that the tutor kept the student involved in the conversation with a successful

understanding of each exchange until there was a vertical bar in the graph which projected above the zero line. The appearance of a vertical bar above the zero base line indicated that the tutor had challenged the student with a question which led to a reply indicating that the student did not understand the substance of the remark. The student had entered the ZPD, and ordinarily the tutor responded with another question which drew the student back into that area of the conversation where both of them understood the substance of what they were talking about.

If one looks at these patterns for different pairs of preservice teachers and students, there is considerable variability in the patterns. Much more work examining the existing data is necessary in order to have a better understanding as to what the tutor is teaching and what the tutee is understanding. In order for the student to learn new ideas, it is necessary for the student to enter the ZPD. At this point, one can only speculate as to how often or how deep the intrusion into the Zone of Proximal Development must be in order to maximize learning for a particular student in a particular curriculum content area.

Discussion: Exhibit 1 in the Appendix lists an excerpt from one of the on-line conversations. Most of the on-line sessions start informally as shown in the first page of Exhibit 1. In the following three pages, the preservice teacher displayed a map of the United States which displayed several cities, rivers, and bodies of water. Then, she helped the student use the map's scale of distance to estimate the distance from Detroit to Miami and then estimate distances to other cities.

Figures 1 through Figure 4 in the appendix illustrate that the conversation was predominantly low order convergent type questions asked by preservice teacher A. Preservice teacher B was also heavily

emphasizing low convergent questions, but high order convergent questions began to emerge in the conversation. This is increasingly apparent in graphs for Preservice Teacher B in Figure 3 and Figure 4.

Table 1 illustrates the individual student report which was prepared for each student who was tutored. The first column lists the curriculum concepts which were discussed by the preservice teacher with the student. The report used a single scale of 1 to 5 to indicate the preservice teacher's estimate of the student's understanding of concepts which were discussed. It is a composite rating of several conversations which the student had with different preservice teachers. Table 2 provides a similar evaluation for a second student.

Copies of the reports were sent to each student's school to be delivered to the home room teacher.

Table 3 provides a school report listing the various concepts discussed by preservice teachers with the students. It shows the five point scale to estimate levels of understanding of the concepts. The numbers in each column indicate the number of students in the school who were in the on-line tutoring program and were rated at one of the five levels of understanding. For example, prime numbers and reducing fractions were discussed frequently. Concepts in language arts and social studies were also discussed in the on-line tutoring sessions.

Figures 5 through Figure 10 illustrate some of the simpler graphs in which Vygotsky's Zone of Proximal Development is used as a means of estimating how the conversations are proceeding. Each vertical bar represents a question posed by the preservice teacher and some reply by the student. Each bar below the zero base line indicates that the student understands the preservice teacher's question and responded

appropriately. A sequence of vertical bars below the zero base line indicates that their conversation is running smoothly and they understand one another clearly.

When a vertical bar appears above the zero base line, this shows that the student's reply indicates that he/she does not understand the question or what is requested and has made an inappropriate reply. The student has entered their Zone of Proximal Development and needs help or clarification from the preservice teacher so that they may continue a smooth exchange of ideas.

Figure 5 shows a small sample of 34 conversational exchanges in which a vertical bar appeared above the zero base line on three occasions. However, Figure 10 shows about 15 occasions when the student responded inappropriately during the 183 exchanges. Other figures show more complex interactions. It is important to recognize that Vygotsky's model asserts that the student must enter the Zone of Proximal Development in order to learn something new. When they do enter the Zone of Proximal Development, the teacher or adult or knowledgeable peer should be there to clarify or assist the student understand what was asked or being discussed.

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APPENDIX

Exhibit 1 Excerpts from the Conversation of Preservice Teacher and Student in Grade 7

Student: Hello?

Teacher: Charlotte?

Student: Yeah.

Teacher: How are you, today?

Student: Fine.

Teacher: That's good. Did you go on the field trip, on Friday?

Student: Uh huh.

Teacher: How was that?

Student: It was ok.

Teacher: Was it?

Student: Uh huh.

Teacher: Have you ever been there, before- to either one of those?

Student: No.

Teacher: You haven't? What were some of the cool things you saw?

Student: In the Science Center, it was a lot of stuff that was real fun. In The African-American Museum, it was this slave ship, with all these fake people on it. It had last names of people, on the ship.

Teacher: Uh huh.

Student: But I couldn't find my last name.

Teacher: Oh really? Well that's cool. How was your weekend?

Student: Fine. I went to Toronto.

Teacher: Oh, you did? What did you do there? I forgot you guys were going there.

Student: I went to the Science Center.

Teacher: Was it a lot like the Detroit one?

Student: No.

Teacher: What were some of the new- the different things?

Student: They had a lot of different stuff. They had, like, this bike that you could ride across

Teacher: You wanna- Have we done the combined math and social studies exercise, yet?

Student: No.

Teacher: I haven't done the map with you, and the distance?

Student: No.

Teacher: Ok. We can do that, then. I'm gonna clear this whiteboard. I'm gonna pull up a map of The United States. You just tell me when it comes up. Ok?

Student: UH huh.

Teacher: It should be up pretty soon.

Student: Ok. It's up.

Teacher: Ok. Do you recognize any of the cities on the map?

Student: Uh huh.

Teacher: Which ones have you been to? I know you've been to this one and this one, last weekend. Have you been to any of the others?

Student: Uh huh.

Teacher: Why don't you grab your pointer, on the left hand side, right by the "A" and point to some of the cities for me. Tell me what sates they're in, 'cause I know the states aren't marked. If you know what state they're in, you can tell me, though,

Student: Chicago.

Teacher: What state's that in?

Student: Illinois.

Teacher: Good.

Student: Los Angeles.

Teacher: Uh huh.

Student: I think it's in California.

Teacher: Yep.

Student: I've been to Dallas.

Teacher: Dallas?

Student: Uh huh.

Teacher: OK. What state's that in?

Student: Texas.

Teacher: Good. That's a lot of traveling, by itself. How 'bout any of the cities that you wanna visit, that you haven't visited yet?

Student: No.

Teacher: Not really?

Student: Uh uh.

Teacher: You don't wanna visit New Orleans?

Student: No.

Teacher: No? Ok. What we're gonna do here, is- You see this scale?

Student: Uh huh.

Teacher: Have you ever done scales on maps, before?

Student: No.

Teacher: Ok. What this does is... You see where- Form line to line...

Student: Uh huh.

Teacher: ... the distance is 500 miles. Ok? SO what we're gonna do is: We're gonna pick some cities in The United States and we're gonna figure out, how far apart hey are.

Student: Uh huh.

Teacher: Ok? How we do that is: We count how many sections, that are about this small, are in the paths of one city to another. Ok?

Student: Uh huh.

Teacher: OK. So first of all, we'll think of some cities. Well, if there's no cities that you wanna visit, I'll do the first one. Ok?

Student: Uh huh.

Teacher: And you can help me figure out the distance. Even though it's very hot down there right now, I think I wanna visit- from Detroit- go all the way down to Miami. Do you see that line drawing in?

Student: Uh huh.

Teacher: I'm gonna, actually, erase that and do a straight line. Ok. So from Detroit to Miami. Now with your pointer, why don't you show me the first- if we started off in Detroit, show me where the first 500 mark would be?

Student: Right above- A little bit above Atlanta.

Teacher: A little bit above Atlanta? Ok. I'll put a mark there. Do you think- How much is left in that trip? Is it 500 miles, quite? Is it more than 500?

Student: Just a little bit below 500.

Teacher: A little bit under it? Or a little bit more?

Student: A little bit more.

Teacher: Ok. SO what do you estimate? This is an estimation game, too. How long do you think the rest of the trip is gonna be, right here? Maybe 550?

Student: Uh huh.

Teacher: OK. So what's the total trip gonna be? We've got a section that's 500 and a section that's 550. So how long is that trip?

Student: 1,050 miles.

Teacher: 1,050?

Student: Uh huh.

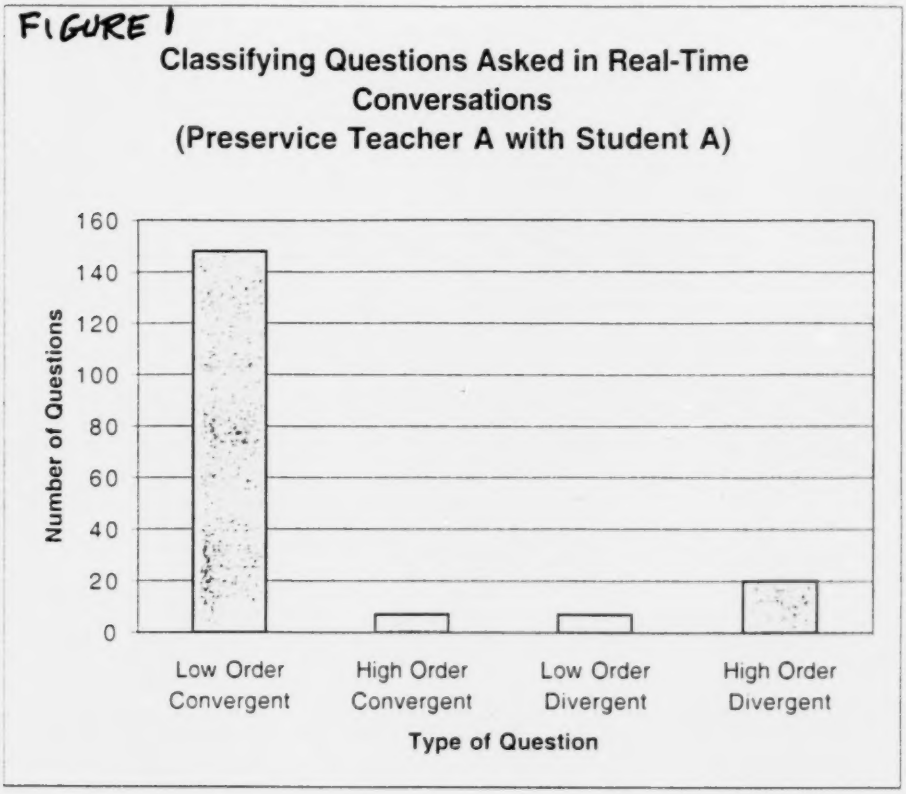
Teacher: Ok. All right. What's a city that you might- or that you'd like to visit, that you would like to go to, from Miami?

Student: Um... Los Angeles.

Teacher: Los Angeles? Ok. We'll go there, next. All right. You see that line?

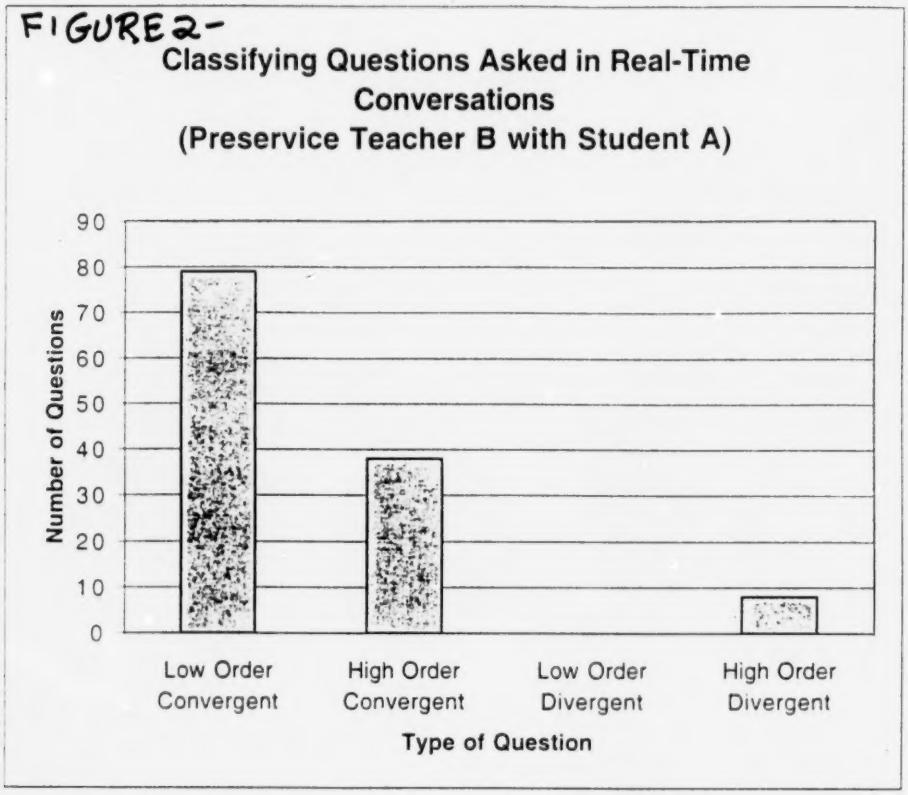
Low Order Convergent	High Order Convergent	Low Order Divergent	High Order Divergent
148	7	7	20

FIGURE 1



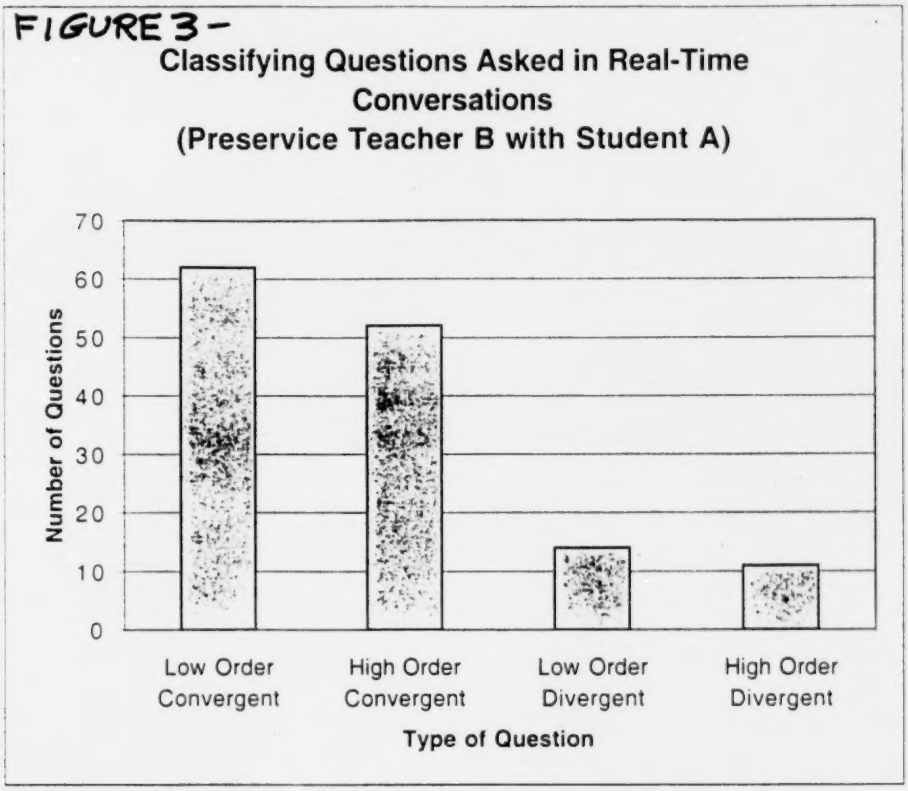
Low Order Convergent	High Order Convergent	Low Order Divergent	High Order Divergent
79	38	0	8

FIGURE 2-



Low Order Convergent	High Order Convergent	Low Order Divergent	High Order Divergent
62	52	14	11

FIGURE 3 –



Low Order Convergent	High Order Convergent	Low Order Divergent	High Order Divergent
42	33	11	6

FIGURE-4

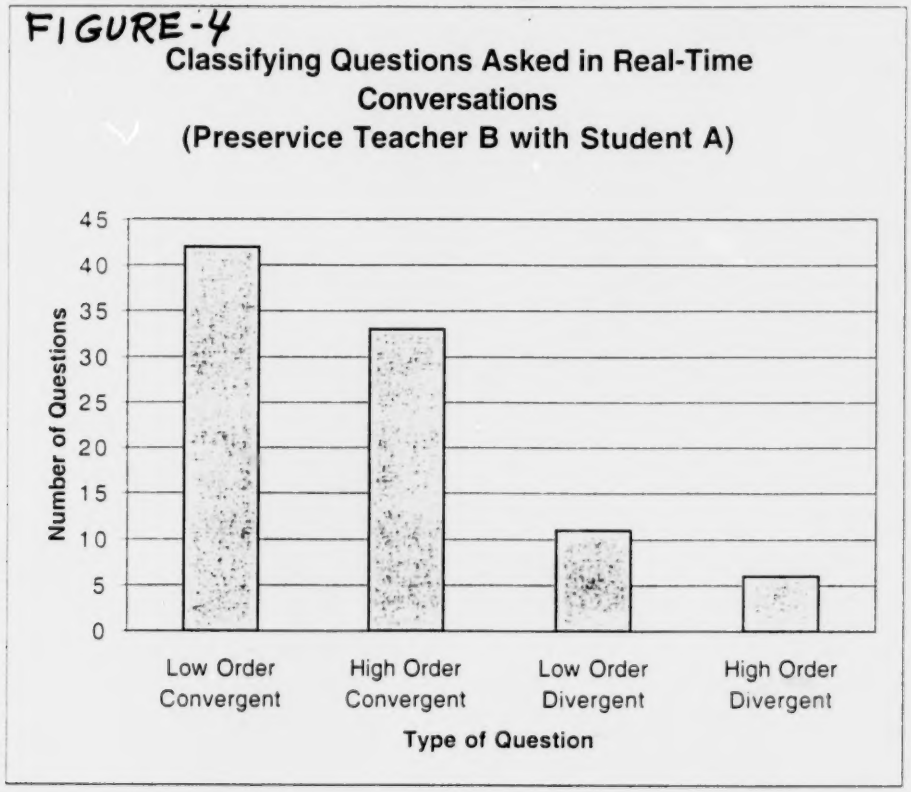


TABLE 1

INDIVIDUAL EVALUATION OF STUDENT UNDERSTANDING IN REAL-TIME CONVERSATIONS

NAME: [redacted]
SCHOOL:
GRADE: 7th
RATING BASIS: Estimated levels of student's understanding of concepts in real-time conversations (1-5)
1=little or no understanding of concepts presented
5=genuine understanding and ability to apply concepts correctly

	6-15-99	6-21-99	6-28-99	7-7-99	7-12-99	7-15-99
CONCEPTS DISCUSSED	***LEVEL***	***LEVEL***	***LEVEL***	***LEVEL***	***LEVEL***	***LEVEL***
World map identifications						
--Continents	4					
--Oceans	3					
United States map identifications						
--North American countries	3					
--Great Lakes	3					
--States (given abbreviation)	3			3		
--Regions	4					
--Capitals	1		3			
--Major cities	1		3			
Base ten		2				
Simple exponential form		3				
Multiplication facts		4				
Prime factorization--factor trees		3	2			
Long division		2	2			
Using scales to determine distance			3			
Using MPH (miles per hour) in story problems			2			
Spelling				3		
United States map identifications --States (without abbreviation)				1		
Compass directions				3		
Changing decimal fractions into common fractions				1		
Changing decimal fractions into percents				1		
Taxes				2		
Nouns/subjects					3	4
Verbs					3	3
Adjectives					2	4
Pronouns					3	
First person voice					1	
Adverbs					2	
Reducing fractions					5	
Fractions of shapes					5	
Direct objects					1	
Articles					2	
Plural/singular						4
Verb tenses						3

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TABLE 2

INDIVIDUAL EVALUATION OF STUDENT UNDERSTANDING IN REAL-TIME CONVERSATIONS

NAME: [redacted]
SCHOOL:
GRADE:

RATING BASIS: Estimated levels of student's understanding of concepts in real-time conversations (1-5)
1=little or no understanding of concepts presented
5=genuine understanding and ability to apply concepts correctly

	12-4-98	12-11-98	4-23-99 (chat)	5-24-99	6-7-99	6-28-99
CONCEPTS DISCUSSED	***LEVEL***	***LEVEL***	***LEVEL***	***LEVEL***	***LEVEL***	***LEVEL***
Prime factorization	3	4				
Simple exponential form		3				
Reducing fractions			4	4		
Order of operations				3		
Multiplication of fractions				3	1	
Perimeter				4		4
Area				3		4
Decimal fraction operations					1	
Changing decimal fractions into common fractions					1	
Changing common fractions into decimal fractions					2	
Base ten/place value						3
Deposit						3
Withdrawal						3
Balance (in terms of banking)						3

Individual evaluation of student understanding in real-time conversations for David Garrett, cont.

	3-26-99	6-21-99	7-14-99
CONCEPTS DISCUSSED	***LEVEL***	***LEVEL***	***LEVEL***
United States map identifications			
--States (given abbreviation)	3		3
--Great Lakes			2
--Major cities			1
--Capitals			1
World map identifications --Continents	3		3
Nigeria facts	3		
Myths		1	
Folktales		1	
Reading interpretation		2	
Native American culture		2	

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TABLE 3

GROUP EVALUATION OF STUDENT UNDERSTANDING PER SUBJECT AREA IN REAL-TIME CONVERSATIONS--[redacted] SCHOOL

RATING BASIS: Estimated levels of students' understanding of concepts in real-time conversations (1-5)
1=little or no understanding of concepts presented
5=genuine understanding and ability to apply concepts correctly

I. Mathematics Concepts

	Level of Understanding				
Concepts	***1***	***2***	***3***	***4***	***5***
Intermediate computation --Long division		3			
Factor--definition				1	
Product--definition				1	
Multiplication facts	1	6	3	4	5
Division facts				2	
Divisibility/multiplication rules			2		2
Numbers in a series/pattern			1	1	
Ordering numbers		2			
Measurement					
--Area		1	2	1	
--Perimeter			1	3	
--Volume			1		
--Conversions (feet to inches)					1
Average	1				
Probability			1		
Prime numbers					
--Definition	1	3	3		1
--Prime factorization	1	6	10	5	3
Least common multiples			1		
Greatest common factors		1	4	1	1
Composite numbers			1		
Order of operations			2		
Whole numbers--definition	1				
Simple exponential form			6	2	
Commutative property			2	1	
Binary operations			1		
Associative property			1		
Tables		1			
Graphing		1	2		
Common fractions					
--Fractions of shapes			1		5
--Numerator/denominator			2		2
--Common denominators		1	1		
--Adding fractions	1	3	4	2	4
--Subtracting fractions	1	1			1
--Multiplying fractions	2	1	7	5	2
--Dividing fractions		1	4	2	1
--Equivalent fractions			4		2
--Reducing fractions	1	1	10	12	3

Composing decimal and common fractions		1			
Changing common fractions into decimal fractions		3			2
Changing decimal fractions into common fractions	3	1	1		2
Decimal fraction operations	1	1	1		
Changing decimal fractions into percents	1			1	
Improper fractions--definition	1	4	1		3
Mixed numbers--definition	1	2		1	2
Computation with mixed numbers	1		1	2	
Changing improper fractions into mixed numbers	1	1	3		2
Changing mixed numbers into improper fractions			2	1	3
Changing improper fractions into decimal fractions		1			
Operations with positive and negative numbers		2	1		
Base ten/place value		1	1	2	
Algebra					
--Variables	1	2			1
--Basic problem solving		5	1	1	
Using MPH (miles per hour) in story problems		1	1		
Deposit			2		
Withdrawal			2		
Balance (in terms of banking)			1		
Taxes		1			
Total students	***20***	***58***	***95***	***51***	***44***

II. Language Arts Concepts

	Level of Understanding				
Concepts	***1***	***2***	***3***	***4***	***5***
Spelling and vocabulary		3	3	4	1
Swahili spelling and vocabulary			2	1	
Spanish spelling and vocabulary			1		
Identifying parts of speech					
--Nouns (subjects)		2	2	2	2
--Direct objects	2				
--Verbs		4	2		1
--Adjectives	1	2	1	3	
--Adverbs	1	2	1	1	
--Pronouns			1	1	
--Articles		2			
--Helping verbs			1		
--Coordinating conjunctions			1		

Verb tenses			1		1
Plural/Singular				2	
Compound words			3		
Contractions					1
Subject/verb agreement			1		
Comma placement		1	1		
Sentence composition (written and spoken)		1	2	3	4
Subject and predicate	2				
Changing sentence fragments into complete sentences					1
Writing process					1
Voice					
--First person	1		1		
--Third person			1		
Symbolism/imagery		1	1		
Metaphor		1			
Personification		1			
Student-produced works (prior to lesson)					5
Poetry composition	1				
Student reading and interpretation		2	1	1	1
Myths	1	1		1	
Folktales	1	1		1	
Story maps					
--Setting/characters			2	2	3
--Conflict			2	2	2
--Goal				1	4
--Action/plot			3	3	
Total students	*10*	*24*	*34*	*28*	*25*

III. Social Studies/Geography Concepts

	Level of Understanding				
Concepts	*1*	*2*	*3*	*4*	*5*
Map navigation					
--Equator		1	3		1
--Compass directions	1	1	2	3	
--Using scales to determine distance		1	1	2	1
--Navigation with directions			1		
United States map identifications					
--States (given abbreviation)		3	7	7	4
--States (without abbreviation)	1		1		
--Capitals	4	3	4		
--Bodies of water/oceans		3	2	4	4
--Great Lakes	1	3	6	1	
--Mountain ranges			2	2	
--Major cities	2		3	1	1

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--Climate/agriculture			1	2	
--Recognizable features		1	4	3	
--Historical events	1		1		
--Settlers/colonization	1				
--Size comparison of US states				1	
--North American Countries		1	3	1	1
--Regions			1	1	
--Native American culture		1			
World map identifications					
--Continents		1	2	3	
--Oceans/bodies of water	1	2	1		1
--Seas				1	
--Countries		1	1		
--Politics	1				
--Climates			1		
--Recognizable features	2				
--Historical events	1				
Africa map identifications					
--Countries/cities		1			2
--Culture/customs/religion. etc.			1		1
--Climate/Agriculture			1		2
--Bodies of water			1		
--Sierra Leone facts			1		
--Nigeria facts			1		1
Europe map identifications					
--Countries (given name)	1		2	3	1
--Countries (without name)	1				
--Culture/customs/religion. etc.	1	2	2	1	
--Climate/agriculture/size	1				
--Capitals	1	1			
--Historical events	3				
--Bodies of water	1				
Asia map identifications					
--Countries/landmarks			1	1	
--Culture/customs/religion. etc.			1	1	
--Climate/agriculture				1	
South America map identifications					
--Bodies of water			1		
--Culture/customs/religion. etc.			1		
--Climate/agriculture			1		
--Historical events			1		
--Countries				1	
Antarctica--student inquiry					1
Wars	1				
Rural vs. Urban			1		
World's tallest buildings			1		
Total students	***26***	***26***	***65***	***40***	***22***

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FIGURE 5-

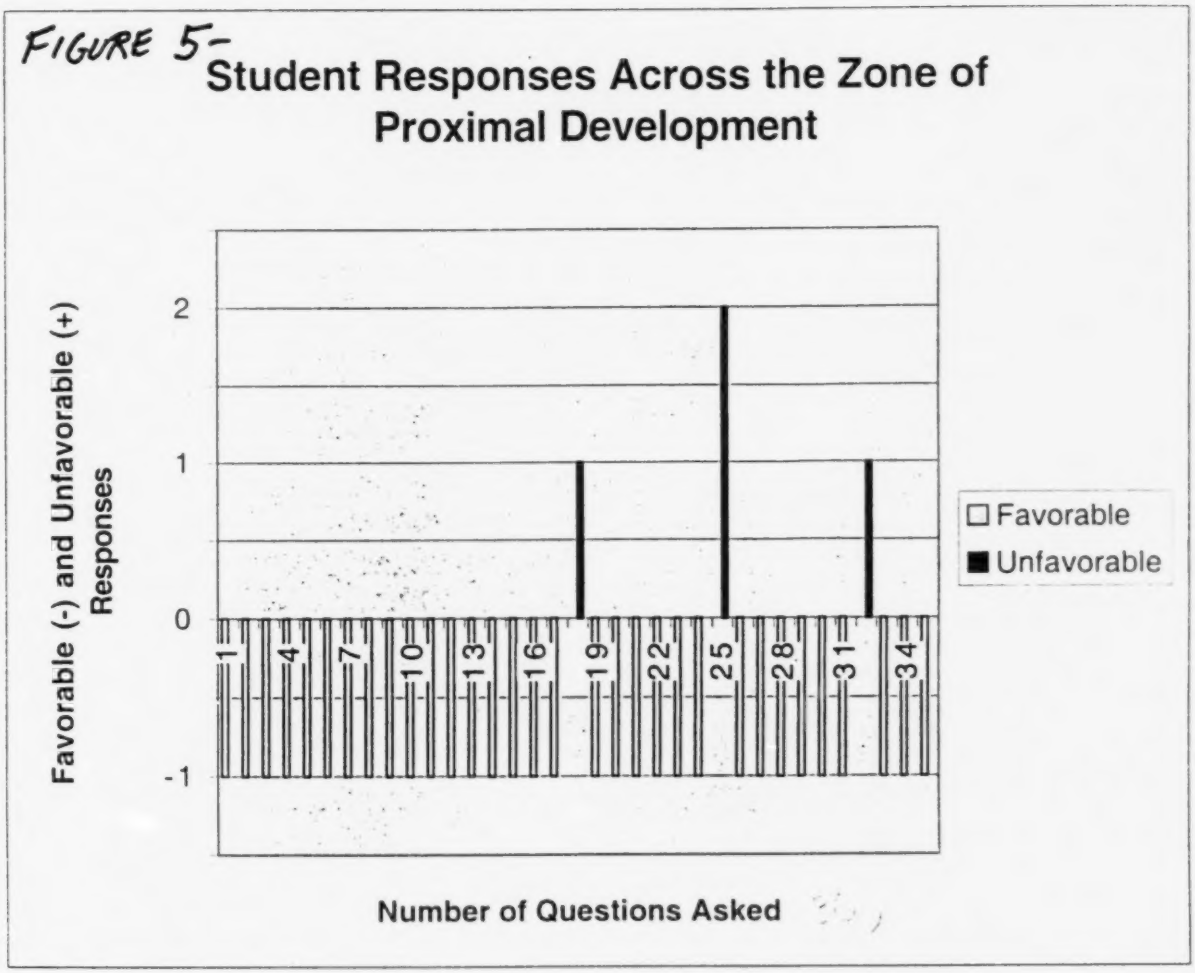

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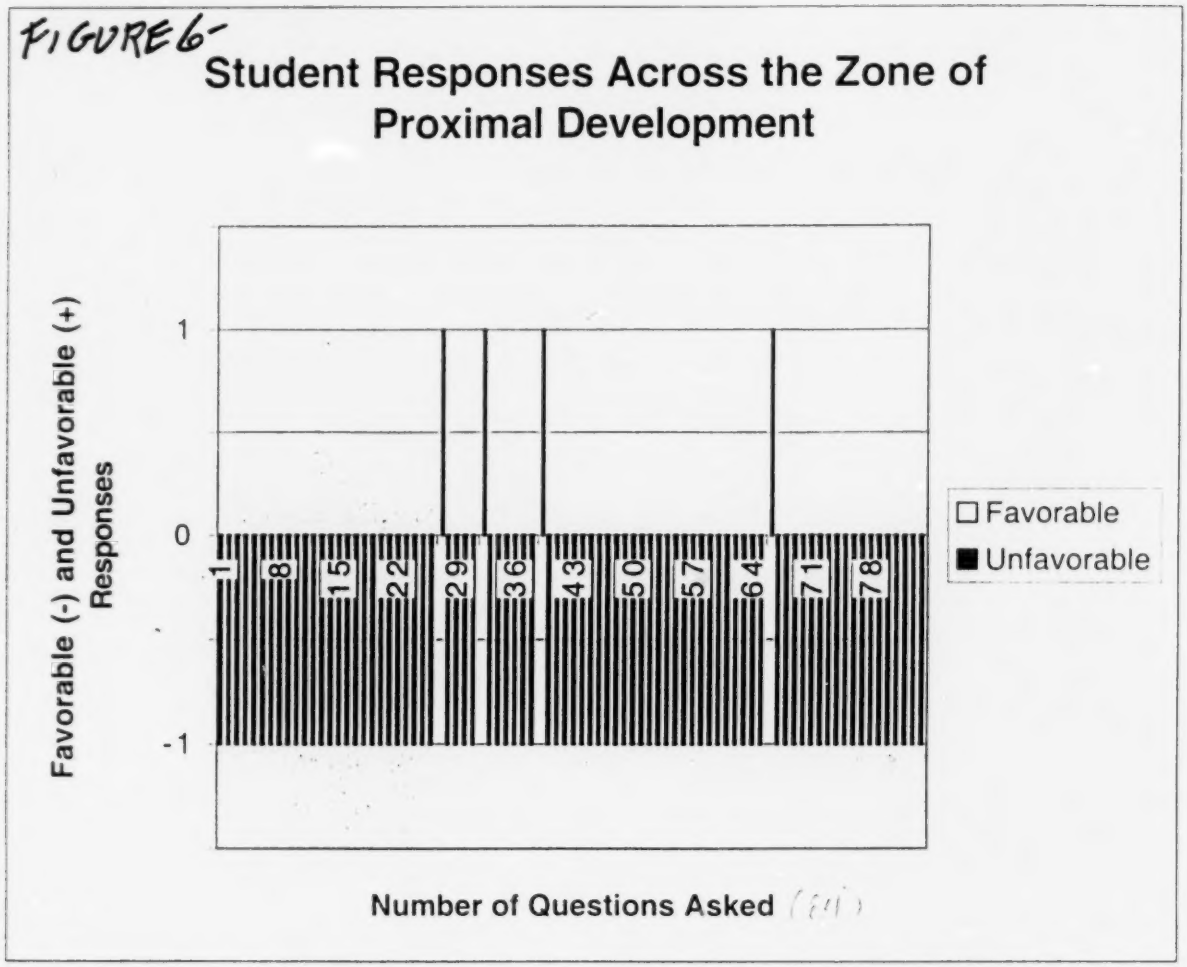
FIGURE 6-



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le and Unfavorable Responses--[redacted] (12-4-98)

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FIGURE 7-

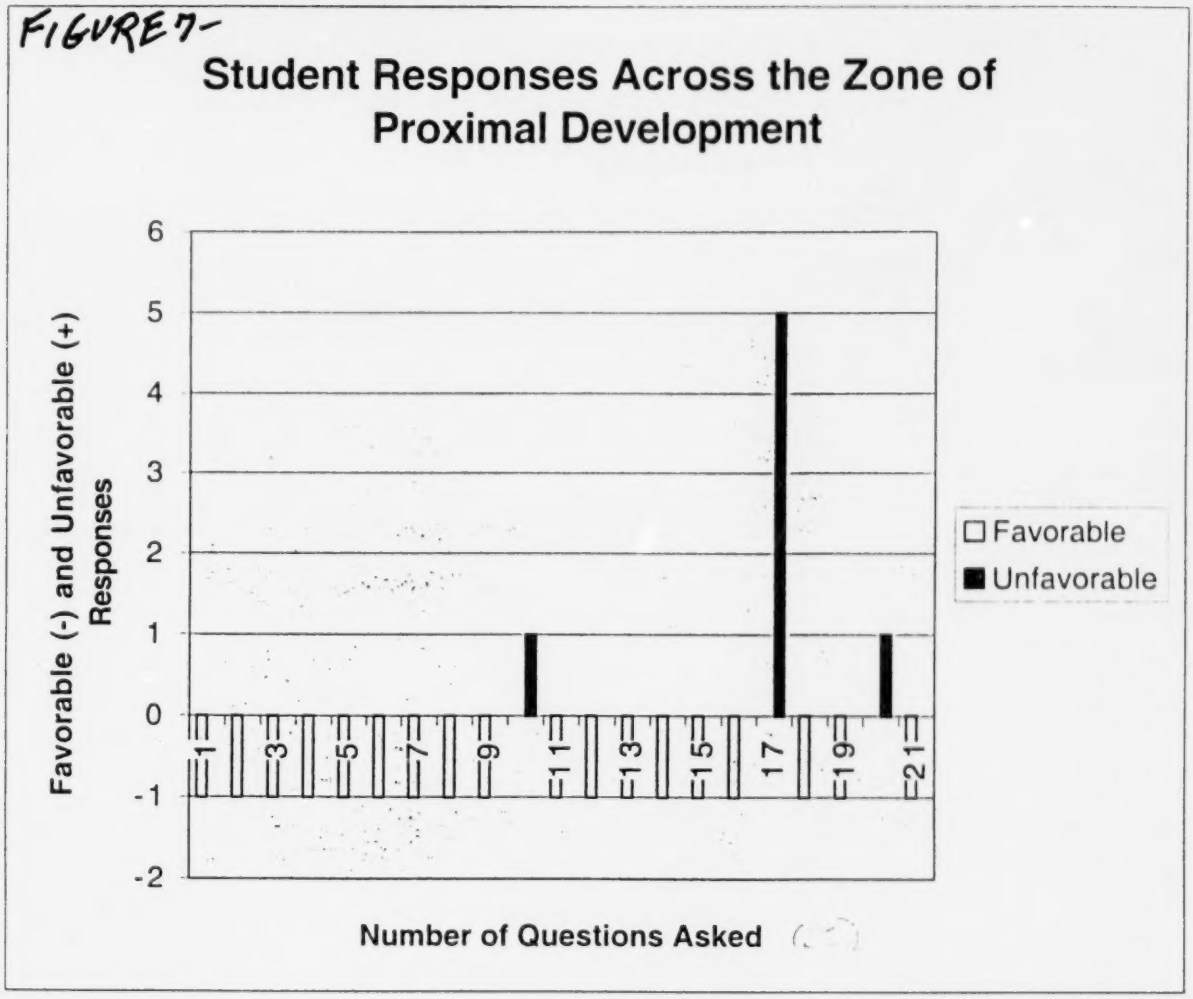

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FIGURE 8-

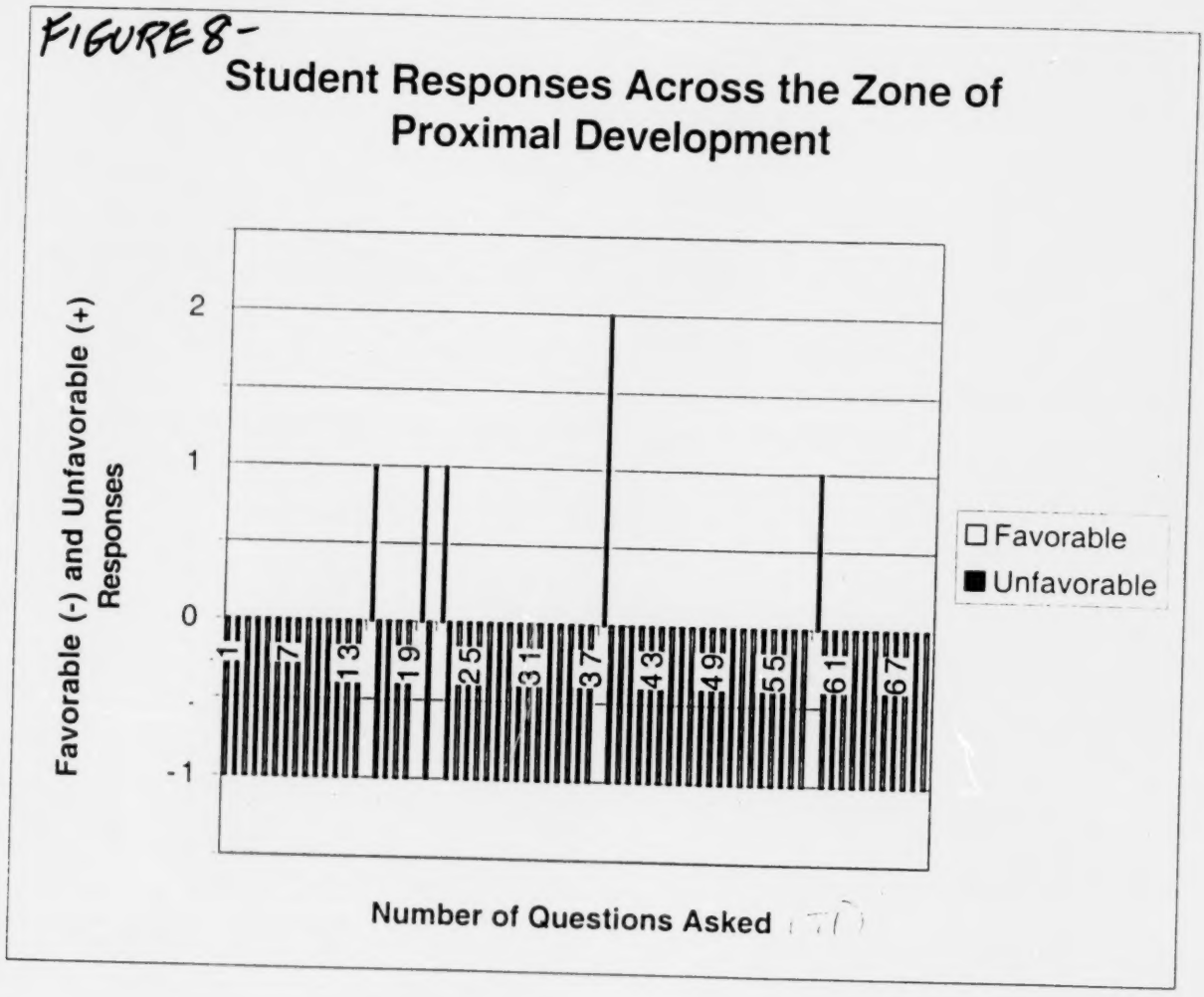

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FIGURE 9-

Student Responses Across the Zone of Proximal Development

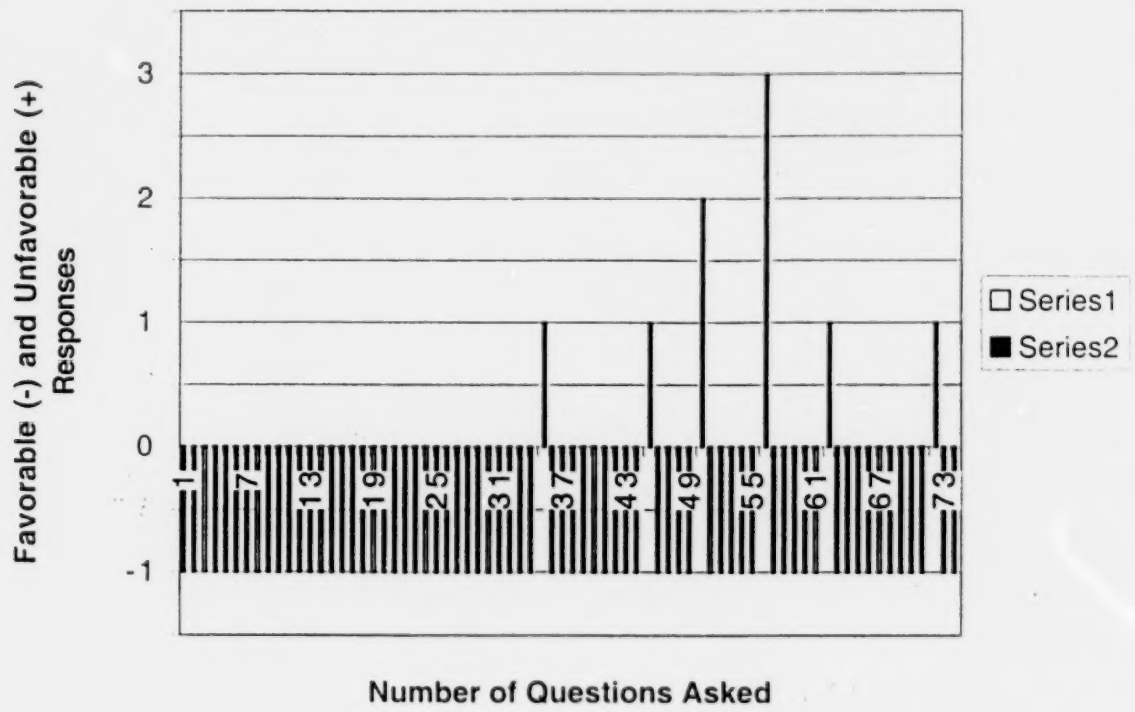

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FIGURE 10